Journal of Indian Business Research

Investor sentiment, risk factors and stock return: evidence from Indian non-financial companies

Saumya Ranjan Dash Jitendra Mahakud

Investor sentiment, risk factors and stock return: evidence from Indian non-financial companies

Saumya Ranjan Dash and Jitendra Mahakud
Department of Humanities and Social Sciences, IIT Kharagpur, Kharagpur, India

Abstract

Purpose – The purpose of this paper is to evaluate the pricing implication of aggregate market wide investor sentiment risk for cross sectional return variation in the presence of other market wide risk factors.

Design/methodology/approach – The paper employs the Fama and French time series regression approach to examine the impact of market risk premium, size, book-to-market equity, momentum and liquidity as risk factors on stock return. Given the importance of inherent imperfect rationality or sentiment risk, the paper further investigates the impact of investor sentiment on the cross section of stock return.

Findings – The choice of a five factor model is apparently persuasive for consideration in investment decisions. Stocks are hard to value and difficult to arbitrage with characteristics which are significantly influenced with the sentiment risk. It is naïve to argue for the universal pricing implication of sentiment risk in a multifactor model framework.

Research limitations/implications – The test assets portfolios are not segregated as per any industry criteria.

Practical implications – Investment managers can use a contrarian investment strategy, for the stocks that are hard to value and riskier to arbitrage to gain excess return when the market follows a downward trend.

Originality/value – This makes the first attempt towards the investigation of the impact of the sentiment risk on cross sectional return variation from an emerging market perspective on such a diversified and large test asset portfolios. The paper has extended the available literature by investigating the impact of sentiment risk after controlling the liquidity risk factor in a multifactor specification. This measure of market wide irrational sentiment index is more comprehensive.

Keywords Sentiment risk, Five factor model, Liquidity risk, Risk management, Momentum strategy, Stock returns, India

Paper type Research paper

1. Introduction

Based up on the foundation framework of capital market theory and assumptions of rational risk averse investors operating in an efficient capital market, proponents of mainstream asset pricing models like capital asset pricing model (CAPM) (Lintner, 1965; Sharpe, 1964), intertemporal capital asset pricing model (ICAPM) (Merton, 1973), arbitrage pricing theory (APT) (Ross, 1976) and consumption-based CAPM (Breeden, 1979) have tried to identify and price market wide and macroeconomic risk factors to explain cross section of stock return. However, beyond as a source of graceful theoretical contribution, there are considerable evidences available that contradicts the central predictions of the traditional asset pricing models (see for, e.g. Campbell, 2000; Fama and French, 2004; Subrahmanyam, 2010; for a detail review of literature).

Journal of Indian Business Research
Vol. 4 No. 3, 2012
pp. 194-218

1755-4195
DOI 10.1108/17554191211252699

Since the documentation of size effect by Banz (1981) the asset pricing literature argue towards the presence of a cross sectional structure involving firm characteristics such as book-to-market equity (Fama and French, 1992), short-term momentum (Jegadeesh and Titman, 1993) and liquidity (Amihud, 2002) which cannot be explained by the suggested risk factors of mainstream asset pricing literature.

In recent years, following the theoretical argument of multifactor model specification (Merton, 1973; Ross, 1976) and motivated with the characteristic based risk pricing, the three factor (Fama and French, 1993), and four factor model (Carhart, 1997) have been widely debated and acclaimed in asset pricing literature to explain the cross section of average stock returns. While Fama and French (1993) three factor model consisting of a market factor and trade portfolios on size (small-minus-big, i.e. SMB) and book-to-market equity (high-minus-low, i.e. HML), Carhart (1997) advocates towards a four factor model or an augmented three factor model with a momentum factor (winner minus loser, i.e. WML) to explain stock return behaviour. Given the impact of liquidity in the cross sectional return variation, several researchers also tried to augment the four factor model with a liquidity factor for the apparent explanation of stock return behaviour in a five factor model (FFM) specification. In common the multifactor approach validates the fact that, since intercepts of the traditional asset pricing models deviate statistically from zero the missing risk factors are the potential reason for concern. In this regard the basic objective of multi factor model proponents is to introduce additional factors in the form of excess returns on the trade portfolios formed on the basis of risk characteristics, and to re-examine the hypothesis of intercepts indistinguishable from zero. Consistent with this argument asset pricing literature also support a dependable performance of these multi factor models in both developed and emerging markets across a wide spectrum of sample periods (Her *et al.*, 2004; Keene and Peterson, 2007; Lam and Tam, 2011; Sehgal and Jain, 2011; Shum and Tang, 2005).

However, the key assumptions of several asset pricing models including the recent multifactor models fail to explain time and again the unconventional market behaviour or irrational exuberance (Shiller, 2005) which limits the investor's ability to quantify risk premium and to diversify portfolio risk in a state of persistent noise trading (Black, 1986), and limit to arbitrage (Shleifer and Vishny, 1997). It has been also argued that the existence of a factor structure by no means implies that risk premiums are determined by fundamental risk alone (Shefrin, 2005). As there is no general consensus regarding the forces that give rise to the cross sectional regularities in the form of risk characteristics (such as size, book-to-market equity, momentum and liquidity), the empirical validation of risk factors constructed from such characteristics can never be suggested as the sole determinant of stock return (Barberis and Thaler, 2003; Shefrin, 2005). For instance several authors like Lakonishok *et al.* (1994) and MacKinlay (1995) advocated towards the behavioural biasness of investor which amounts to book-to-market equity factor as a priced risk. Nonetheless given the anecdotal market movement with boom and bust cycles, literature on behavioural asset pricing provides several striking claims towards a number of behavioural biases which can be a potential cause of concern to limit the investor's behaviour as rational (see for, e.g. Hirshleifer, 2001; Ritter, 2003, for an exhaustive discussion).

Alternative to the efficient markets paradigm, and assumption of complete arbitrage, behavioural finance is build upon two fundamental arguments towards the mispricing in financial markets, i.e. the role of investor psychological biasness

(Kahneman and Tversky, 1979), and limited arbitrage in determining stock prices (Brown and Cliff, 2005; Shleifer and Vishny, 1997). The theoretical arguments of behavioural asset pricing literature suggests that, since all investors fail to hold objectively correct belief about the fundamental price because of inherent behavioural biasness, the demand shifts induced by irrational speculation in a state of arbitrage constraint generates systematic sentiment risk. Following such argument proponents of behavioural asset pricing argue that investors in stock market bear not only systematic risk but also irrational component of sentiment risk which act as limits to the arbitrage activities of rational traders (DeLong *et al.*, 1990).

Over the years numerous empirical studies have been conducted to investigate the relationship between sentiment risk and stock return by using different types of sentiment indicators and stock markets. Baker and Wurgler (2007) suggest that the existing literature can be categories in terms of top-down or bottom-up approach. The top-down approach uses cognitive bias in individual investor psychology to explain how individual investors under or over react to past returns or fundamentals (Barberis *et al.*, 1998; Daniel *et al.*, 1998). In contrast the bottom-up approach uses a reduced form of aggregate investor sentiment (i.e. by using sentiment index or implicit market wide sentiment proxies) to trace its impact on aggregate market and individual stocks return (Baker and Wurgler, 2006, 2007; Brown and Cliff, 2004, 2005; Fisher and Statman, 2000; Finter *et al.*, 2011; Verma and Soydemir, 2009). To make the argument more illustrative, one can suggest that, while the top-down approach provides a micro foundation for the variation in individual investor sentiment, the bottom-up approach explores the macroscopic prospective of aggregate market wide sentiment risk and its effect on time series and cross sectional variation of stock return. Following the bottom-up approach several studies have found that a negative and significant relationship between individual investors sentiment and stock return (Baker and Wurgler, 2006, 2007; Fisher and Statman, 2000). More specifically, Baker and Wurgler (2006, 2007) suggest that the impacts of sentiment risk are most profound on the stocks whose valuations are highly subjective and difficult to arbitrage. More specifically when investor sentiment appears to be high (low), overvaluation (undervaluation) is highest among the stocks that are hardest to value and hardest to arbitrage.

However, the existing literature provides several conspicuous gaps which can be explore further to revisit the sentiment evidence. The results of above studies can be more subjective because of the test assets used in these studies are based up on single characteristics like, size, book-to-market equity, age, volatility or dividend yield (i.e. hard to value and/or hard to arbitrage characteristics). Since, the inference of a risk factor pricing can be biased because of the strong factor characteristics of underlying test assets (Lewellen *et al.*, 2010), it can be argued that the hard to value and hard to arbitrage stocks may have shown the statistically significant pricing of sentiment risk because of their single sorted factor structure. It is therefore more apparent to investigate the pricing of sentiment risk with a test asset which encompasses all the well debated risk characteristics like size, book-to-market ratio, liquidity and momentum. Our argument also supports the philosophy of practical investment scenario. In an actual investment scenario an investor not only concerns with any single risk characteristic rather all the risk characteristics of a stock taken together. Therefore, it is also apparent to investigate the sentiment risk on test assets that encompasses all the major fundamental risk characteristics and not concentrated on a single firm specific characteristic. Another issue that needs further investigation is related to the construction of sentiment index as a proxy for measuring the irrational component of sentiment risk. While making an attempt to constructing the sentiment index from the market related proxies, literature also accepts the fact that there are no definitive or uncontroversial measures of sentiment (Baker and Wurgler, 2006, 2007, pp. 1655, 136; Brown and Cliff, 2004, p. 5; Finter *et al.*, 2011, p. 5). It is therefore, essential to consider other measures of sentiment and not to be restricted only to the few those have been used in the prior literature.

In this context, using a multifactor framework the present study aims to analyse the importance of market wide risk factors for explaining the cross sectional return variation, and to make a comprehensive reassessment for the pervasiveness of sentiment risk after controlling the importance of other risk factors. With particular reference to Indian stock market, the paper contributes the existing literature in several ways:

- Although the available literature have examined the importance of liquidity factor in a multifactor framework for other developed markets, the importance of liquidity factor for Indian stock market has been ignored completely. We have also extended the available literature by investigating the impact of sentiment risk after controlling the liquidity risk factor in a multifactor specification.
- In particular, it makes the first attempt to investigate the impact of sentiment risk on cross sectional return variation of Indian listed firms. It is imperative to mention here that, even though for the Indian market Sehgal *et al.* (2009, 2010) have made an early attempt to develop a sentiment index to test the causality between investor sentiment and stock index return, the impact of sentiment risk on cross sectional return variation has been ignored completely.
- Unlike to the prior literature our test asset is more comprehensive as it considers all the major risk characteristics and not confined to any specific risk characteristic with a single or double shorted portfolio. To our knowledge this is perhaps the first attempt from an emerging market to test the impact of the sentiment risk on such a diversified and large test asset portfolios after controlling the effect of five widely acclaimed market wide risk factors (SMB, HML, WML and liquidity factor).
- Our measure of market wide irrational sentiment with the sentiment index is more comprehensive as it considers three other proxies which are not used in prior literature for constructing their respective sentiment index. This also gives an opportunity to create a better sentiment index to capture the market wide irrational component as compared to Sehgal *et al.* (2009, 2010) as their index is not orthogonal to fundamental factors.

Furthermore, the major argument towards the pricing of sentiment risk for explaining stock return behaviour is followed from the aggregate level of investor participation in the market. The aggregate behavioural biasness of investors that results the market wide sentiment risk is implicitly derived from the assumption of high level of retail investors' participation. Based upon such considerations the prior literature that validate sentiment risk are heavily dependent on the developed markets like USA, characterised by high level of retail investor concentration. However, in an emerging market like India with the high level of institutional and promoter ownership it is also perceptible to validate the pervasiveness of sentiment risk in the presence of other risk factors. To be specific, this out of sample evidence from a segmented emerging market (Misra and Mahakud, 2009) is arguably more important given the sample selection bias and data-snooping bias (MacKinlay, 1995) observed in the developed market like USA.

The rest of this paper is organized as follows. Section 2 describes the data and variables, Section 3 outlines the empirical model, Section 4 presents and analyses the empirical results and in the end, Section 5 offers a conclusion.

2. Data and variables

We have used monthly returns of nonfinancial firms listed in the National Stock Exchange (NSE) of India starting from September 1995 to March 2011 (187 months). Number of companies varies between 392 and 1,156 across the sample period. Sample period for the construction of aggregate investor sentiment index includes 98 monthly observations (January 2003 to March 2011). The choice of sample period is conditioned up on the data availability of selected market related sentiment proxies (MRSP). The S&P CNX Nifty has been taken as the market proxy. In choosing an Indian stock index as the market portfolio, we assume implicitly that the Indian stock market is segmented, and the market risk premium is priced because of local macroeconomic, and firm specific factors (Bekaert and Harvey, 2003; Misra and Mahakud, 2009). We begin portfolio formation on September 1 every year since around 80 per cent of the listed firms in the NSE have their fiscal year-end in March. In order to avoid the look-ahead bias, lag period of five months has been maintained between end of accounting year and portfolio formation. Thus, for our analysis accounting data for the year-ending March of year t has been compared with stock return from September of year t to August of year $t + 1$. For all the cases of portfolio formation we hold the respective portfolio positions from September of year t to August $t + 1$, and portfolios were formed and updated at the beginning of September every year. For the risk-free rate proxy, we use 91-days Treasury bill rate collected from Reserve Bank of India web site. The required data on stocks return and other firm specific information has been collected from Centre for Monitoring Indian Economy (CMIE) PROWESS database.

For our analysis size of a company has been proxied by the market capitalisation measured at the end of August of the year t. The book value of common equity in the book-to-market equity ratio is measured at the fiscal year-end in the calendar year t. Stock return momentum has been measured at the end of August of year t, when the returns are calculated over 11-month period beginning in September $t - 1$ and ending in June of year t. Following Jegadeesh and Titman (2001) two month gap between return momentum calculation and portfolio formation has been maintained to minimise the continuation effect of bid ask bounce. Liquidity is measured by the annual average of monthly turnover ratio, i.e. number of shares traded to the number of shares outstanding[1].

2.1 Construction of test assets and five risk factors

Our test assets consists of 36 portfolios, which are formed encompassing the four risk characteristics such as, size (SZ), book-to-market ratio (BME), liquidity (LIQ) and momentum (MOM). For the formation of our test assets, we sort all stocks into three SZ trisects (based on the breakpoints for the bottom 30 per cent as large, middle 40 per cent as medium and top 30 per cent as small), two LIQ and two BME bisects

(50 per cent breakpoint), three MOM trisects (breakpoints for the bottom 30 per cent as winners, middle 40 per cent as neutral and top 30 per cent as loser), yielding 36 portfolios from the matrix of the SZ-LIQ-BME-MOM groups. Value weighted monthly returns are calculated for the 36 portfolios for the following year from the beginning of September through August of the next year.

For the purpose of brevity we report the portfolio groups of SZ/LIQ/BME/MOM as Pi/j/k-L, Pi/j/k-N, Pi/j/k-W. The first subscript in the portfolio notation Pi/j/k-L, Pi/j/k-N and Pi/j/k-W represents the three SZ trisects, for, e.g. small (1), medium (2), large (3). The second subscript denotes the two LIQ bisects, for, e.g. low (1), high (2). Similarly the third subscript represents the two BME bisects for, e.g. low (1), high (2). The last subscripts L, N and W represents the momentum trisects as looser (L), neutral (N) and winner (W), respectively. For instance portfolio group P1/1/2-W indicates a portfolio consisting with small SZ/low LIQ/high BME/winner MOM stocks. Similarly, P3/1/2-L indicates a portfolio consisting with large SZ/low LIQ/high BME/looser MOM stocks. In subsequent reported tables for the purpose of brevity we will report the portfolio groups of SZ/LIQ/BME/MOM as Pi/j/k-L, Pi/j/k-N, Pi/j/k-W instead of their detail descriptions.

Following Fama and French (1993), Carhart (1997), Keene and Peterson (2007) and Lam and Tam (2011), we have constructed five factors designed to mimic risk variables related to MKT (market excess return over the risk-free rate), SMB (i.e. simple average of the value weighted returns on three small stock portfolios minus the value weighted returns on three big stock portfolios), HML (i.e. simple average of the value weighted returns on the two high book-to-market equity portfolios minus the low book-to-market equity portfolios), LQF (low liquid minus high liquid, i.e. difference between the simple averages of value weighted returns from the two low liquid portfolios and two high liquid portfolios) and WML (winners minus losers, i.e. simple average of the value weighted returns of two winner stock portfolios minus the loser stock portfolios).

In Table I we report the descriptive statistics of the test assets and the five risk factors. Table I shows that the annual averages of the number of stocks in the big, low liquid and small high liquid portfolios have fewer firms than big, high liquid and small low liquid portfolios. Figures in Table I suggest that among the 12 looser and 12 winner portfolios the winners outperform the losers across all the portfolios taken together with a spread between loser and winner portfolios mean return of 0.67 per cent per month ($t = -2.48$). The standard deviation proxied for volatility of the entire portfolio remains same with a spread between winner and loser is minimal 0.21 per cent per month ($t = -0.29$). Observed pattern of the level of skewness across the test asset portfolios is consistent with literature on emerging markets (Claessens *et al.*, 1995, 1998; Iqbal *et al.*, 2010).

2.2 Construction of aggregate sentiment index

Existing literature support two different approaches to measure investor sentiment. First, the aggregate investor sentiment as an explicit sentiment proxy calculated directly from survey data of individual investors. Second, implicit sentiment proxy derived from indirect measures of sentiment from selected market statistics and market parameters with theoretical argument towards market movement (Baker and Wurgler, 2006). For our analysis, we have chosen to concentrate on implicit MRSP. Our motivation in this regard is motivated from two reasons. First is the lack of time series survey data for Indian investors. Second, as the effect of sentiment will aggregate

Table I.
Descriptive statistics of return for 36 test asset portfolios and risk factors

	Mean return			SD			Skewness			Kurtosis		
Panel A: descriptive statistics of return for 36 test asset portfolios												
Portfolio groups	*L*	*N*	*W*	*L*	*N*	*W*	*L*	*N*	*W*	*L*	*N*	*W*
P1/1/1	1.56 {24}	1.62 {22}	2.54 {19}	12.54	11.42	13.94	0.52	0.52	0.79	4.03	4.39	4.46
P1/1/2	2.73 {24}	2.8 {21}	3.74 {19}	13.86	13.16	14.52	0.6	1	0.81	3.61	4.69	3.86
P1/2/1	0.72 {22}	1.85 {20}	2.05 {17}	13.76	13.01	13.96	0.71	0.88	0.7	4.24	5.23	4.62
P1/2/2	1.39 {22}	1.48 {19}	1.82 {18}	15.38	14.39	13.51	0.94	1.06	0.6	5.12	5.8	3.74
P2/1/1	1.15 {20}	1.63 {18}	1.94 {20}	10.26	9.96	11.62	0.38	0.65	0.65	4.39	6.47	5.38
P2/1/2	2.21 {18}	2.18 {18}	2.47 {21}	12.21	11.31	10.64	0.59	0.76	0.33	4.68	5.94	3.95
P2/2/1	1.11 {21}	1.67 {18}	1.51 {19}	12.24	12.16	13.41	0.46	0.42	0.48	4.55	4.58	4.76
P2/2/2	2.25 {20}	2.1 {18}	2.97 {18}	13.55	12.5	13.1	0.59	0.5	1.06	4.89	5.07	8.64
P3/1/1	0.85 {18}	1.41 {19}	1.45 {17}	8.66	7.93	9.74	0.29	0.01	0.15	4.08	4.25	4.62
P3/1/2	1.71 {16}	1.62 {19}	2.09 {15}	10.84	9.79	10.34	0.52	0.24	0.48	5.69	4.53	6.02
P3/2/1	0.89 {18}	1.2 {14}	1.39 {17}	10.66	10.38	12.15	0.26	0.09	0.07	3.38	4.47	4.83
P3/2/2	1.88 {18}	2.16 {18}	2.56 {19}	11.81	10.03	11.32	0.54	0.12	0.17	6.06	4.84	5.39
Panel B: descriptive statistics of risk factors												
Risk factors												
MKT		−8.12			7.48			−0.23			0.33	
SMB		0.30			9.97			−1.37			8.00	
HML		1.55			11.12			1.80			4.40	
LQF		0.48			3.50			0.22			1.54	
WML		1.09			10.35			−0.24			3.56	

Notes: The 36 SZ-LIQ-BME-MOM portfolios are formed using three size, two liquidity, two book-to-market equity and three momentum groups; for the purpose of brevity we report the portfolio groups of SZ/LIQ/BME/MOM as Pi/j/k-L, Pi/j/k-N, Pi/j/k-W; the first subscript in the portfolio notation Pi/j/k represents the three SZ trisects, the second subscript denotes the two LIQ bisects and the third subscript represents the two BME bisects; the subscripts L, N and W represents the momentum trisects as looser (L), neutral (N) and winner (W), respectively; size is calculated using the market value of equity at the end of August of the year *t* (reported Rs. in crores); the book value of common equity in the BME ratio is measured at the fiscal year-end in the calendar year *t*; liquidity is proxied by turnover, which is calculated as the ratio of the monthly shares traded to the number of shares outstanding; momentum is calculated as the 11-month returns lagged two month; figures in the curly brackets represent the average number of companies in each portfolio; figures in the curly brackets show the annual average number of stocks for each portfolio across stocks and across the market participants trading behaviour to the market level, so the choice of the implicit MRSP can be more appropriate for getting the overall degree of market wide investor sentiment. In this regard we follow the bottom-up approach of Baker and Wurgler (2006) to construct investor sentiment Index from selected MRSP. As there are no perfect or uncontroversial proxies for measuring sentiment (Baker and Wurgler, 2006; Brown and Cliff, 2004), our approach is necessarily concentrate on 11 such MRSP suggested by prior literature to form a composite sentiment index encompassing the common variation in such underlying proxies. Following are the 11 MRSP selected for our analysis.

Turnover volatility ratio (TVR) calculated as the market turnover ratio (Tr) divided by the standard deviation of stock market return as a proxy for market liquidity measure (Jun *et al.*, 2003). This measure is essentially a volatility adjusted measure of market liquidity. In contrast to prior literature which takes only Tr as a proxy for liquidity our motivation for TVR can be more suggestive one given the high volatility nature of emerging stock markets like India. Another proxy for market liquidity is the share turnover velocity (STV) measured as the ratio between the electronic order book turnover of domestic shares and their market capitalisation[2]. As an indicator of the breadth and depth of a market, and a high ratio indicates better the liquidity or bullish sentiment in the market. Buy-sell imbalance ratio (BSIR) calculated as the ratio of total volume of buy minus total volume of sell to the total volume of buy plus total volume of sell (Kumar and Lee, 2006). Since common sentiments arise when the aggregate trading activities of investors follows pseudo-signals such as price and volume patterns, at an aggregate level when investors are net buyers, i.e. $BSI > 0$ (sellers, i.e. $BSI < 0$), indicates a positive (negative) change in the sentiment. Put/call ratio (PCR) is the trading volumes of put options to call options, and a lower (higher) ratio suggests bullishness (bearishness) sentiment in the market (Brown and Cliff, 2004; Finter *et al.*, 2011). The advance/decline ratio (ADR) calculated as the ratio between the number of advancing and declining stock prices. The rising (declining) values of the ADR can be used to confirm the upward (downward) trend of the market (Brown and Cliff, 2004). We also consider the per cent change in margin borrowing (CMB) as a proxy for market wide bullish sentiment measure as it represents investors using borrowed money to invest (Brown and Cliff, 2004). Following Baker and Wurgler (2006, 2007) and Finter *et al.* (2011) we take the number of IPOs (NIPO) as our another sentiment proxy. The IPO market is often viewed as sensitive to sentiment as the underlying demand for initial public offering is sensitive towards market condition. Based on similar logic we have also calculated the ratio of aggregate equity issuance to total debt and equity issue (EITI). Following the market timing hypothesis (Baker and Wurgler, 2006, 2007; Finter *et al.*, 2011) a higher value of EITI can be considered as a bullish market sentiment. Dividend premium (*Div.P.*) can be defined as the log difference of the average market-to-book ratios of dividend payer and nonpayer stocks. Baker and Wurgler (2006, 2007) suggest that payers are generally larger, more profitable firms with weaker growth opportunities, the *Div.P.* may proxy for the relative demand for this correlated bundle of characteristics and thus negatively related to market sentiment. Flow of funds (FF) for equity mutual fund investments suggest the importance of a preferred asset classes as economic substitutes by the participants in the market, and can be considered as an implicit proxy for investor sentiment (Baker and Wurgler, 2007; Brown and Cliff, 2004; Finter *et al.*, 2011).

From the value of total mutual fund purchased we calculated mutual fund flows into equity funds as the net of all inflows for money market mutual funds and outflows for close ended funds. The proportion of cash to total asset of mutual funds is also used as a sentiment indicator for the optimism (lower CTA) or pessimism (higher CTA) about the market (Brown and Cliff, 2004). All the relevant data for measuring the MRSP have been collected from the NSE, SEBI and AMFI official web sites.

In contrast to prior literatures (Baker and Wurgler, 2006, 2007; Brown and Cliff, 2004) which empirically validated sentiment index from a wide range of market related proxies, we have included three new measures of market wide sentiment index namely, TVR, BSIR, STV that has been supported by related literatures. Table II reports the summary statistics of the selected MRSP. Panel A of Table II suggest that most of the selected MRSP are strongly correlated and all of the correlations in the expected direction. This strongly suggests that there is some common underlying component that is shared by these measures. The direction of the relation between sentiment and these variables is supported from the theoretical arguments given in the related literature. Retaining their theoretical sign our aggregate sentiment index (*ASI*) with respect to the above mentioned MRSP can be represented as:

$$ASI_m = TVR_m + STV_m + BSIR_m - PCR_m + ADR_m + NIPO_m + EITI_m - Div.P_m + CMB_m + FF_m - CTA_m \quad (1)$$

However, when an investor is bullish or bearish, then this could be a rational reflection of future period's expectation or irrational enthusiasm or a combination of both (Baker and Wurgler, 2006, 2007; Brown and Cliff, 2004, 2005). Therefore, it is likely that each MRP for sentiment may include a sentiment component as well as idiosyncratic, non-sentiment related component. Since our interest lies on the irrational component of the sentiment, we have excluded the fundamental and business cycle component from each of the MRSP by orthogonalising the selected MRSP with four fundamental factors (industrial production growth rate, term spread, exchange rate, rate of inflation) and five systematic market wide risk factors (MKT, SMB, HML, LQF, MOM). Since Indian markets are more sensitive to the behaviour of foreign institutional investors (FII), in contrast to prior literature, we have also used percent change in net FII inflow and interest rate differential as additional fundamental factors.

Following Baker and Wurgler (2006, 2007), Verma and Soydemir (2009) and Finter *et al.* (2011) we formulate equation (2) to isolate irrational sentiment component of our sentiment measures from the k fundamental components (FUNDA):

$$MRSP_m = \alpha_j + \gamma_j \sum_{k=1}^{11} FUNDA_{km} + \varepsilon_m \quad (2)$$

where, α_j indicates the constant, γ_j is the parameter to be estimated, ε_t is the random error term. $FUNDA_{kt}$ is the above mentioned fundamental factors. The fitted values of equation (2) capture the rational component of market wide sentiment proxies (i.e. $\hat{MRSP}_m$). On the other hand the residual of equation (2) capture the irrational component of the sentiment. We then use principal components analysis for measuring the common variation and to isolate the common components from the orthogonal MRSP. Panel B of Table II reports the correlation matrix and summary statistics of the orthogonal *MRSP* ($MRSP^{\perp}$). As expected the correlation among the fundamental

Table II. Summary statistics and correlation matrix of MRSP

Panel A: summary statistics and correlation matrix of MRSP

MRSP	*Mean*	*SD*	*Min.*	*Max.*	*Relationship with market sentiment*	*Correlation with market index*[a]	*TVR*	*BSIR*	*PCR*	*ADR*	*STV*	*NIPO*	*EITI*	*Div.p.*	*CMB*	*FF*	*CTA*
							Correlation with MRSP (MRSP)										
TVR	0.05	0.02	0.01	0.12	+	0.43**	1.00										
BSIR	0.00	0.08	−0.24	0.27	+	0.53**	0.15	1.00									
PCR	0.30	0.10	0.12	0.62	−	−0.25**	−0.02	−0.06	1.00								
ADR	0.95	0.23	0.55	1.80	+	0.49**	0.25**	0.22**	−0.01	1.00							
STV	0.71	0.33	0.07	1.53	+	0.04	0.06	−0.02	−0.13	−0.11	1.00						
NIPO	4.23	3.48	0.00	18.00	+	0.08	−0.27**	−0.02	−0.43**	−0.13	−0.07	1.00					
EITI	0.21	0.19	0.00	0.74	+	0.12	−0.02	−0.07	−0.32**	−0.05	0.14	0.34**	1.00				
Div.p.	0.05	0.20	−0.28	0.61	−	−0.16	0.19***	0.36**	−0.01	0.00	0.07	0.08	0.14	1.00			
CMB	0.98	0.02	0.92	1.06	+	0.21**	0.04	−0.11	−0.09	−0.12	0.28**	0.04	0.03	−0.11	1.00		
FF	0.04	0.20	−0.45	1.13	+	0.27**	0.24**	−0.02	−0.27**	−0.02	0.10	0.21***	0.20***	0.13	0.04	1.00	
CTA	−0.08	0.15	−0.38	0.34	−	−0.55**	−0.34**	−0.20***	0.61**	−0.16	−0.10	−0.20**	−0.18***	−0.10	0.10	−0.36**	1.00

Panel B: summary statistics and correlation matrix of orthogonal MRSP

MRSP$^{\perp}$	*Mean*	*SD*	*Min.*	*Max.*	*Correlation with orthogonal market index*$^{\top}$	*TVR*	*BSIR*	*PCR*	*ADR*	*STV*	*NIPO*	*EITI*	*Div.p.*	*CMB*	*FF*	*CTA*
						Correlation with orthogonal MRSP (*MRSP*$^{\perp}$)										
TVR	0.00	0.02	−0.04	0.04	0.51**	1.00										
BSIR	0.00	0.06	−0.19	0.14	0.64**	−0.07	1.00									
PCR	0.00	0.07	−0.18	0.26	−0.44**	0.08	0.02	1.00								
ADR	0.00	0.15	−0.29	0.53	0.36**	−0.21**	0.09	0.19**	1.00							
STV	0.00	0.19	−0.66	0.54	0.11	0.13	0.20**	−0.02	−0.18***	1.00						
NIPO	0.01	2.60	−4.94	8.43	0.03	−0.14	−0.07	−0.23**	0.02	−0.02	1.00					
EITI	0.00	0.16	−0.25	0.53	0.13	−0.14	0.00	−0.18**	−0.31**	0.21**	0.26**	1.00				
Div.p.	0.00	0.56	−2.53	1.01	−0.14	−0.17***	−0.16	−0.20**	−0.03	−0.26**	0.20**	0.05	1.00			
CMB	0.00	0.18	−0.41	0.95	0.34**	0.15	−0.20**	−0.17***	−0.18***	0.23**	0.25**	0.26**	−0.18**	1.00		
FF	0.00	0.20	−0.60	0.54	0.22**	0.26**	0.24**	0.07	−0.06	0.10	0.04	0.07	−0.04	0.13	1.00	
CTA	0.00	0.02	−0.05	0.04	−0.49**	0.39**	−0.02	−0.24**	−0.19**	0.19**	0.29**	0.21**	−0.06	0.19**	−0.41**	1.00

Panel C: correlation matrix of aggregate sentiment index with risk factors

Risk factors	*MKT*	*SMB*	*HML*	*WML*	*LQF*	*ASI*	*asi*
MKT	1.00						
SMB	0.15	1.00					
HML	−0.08	−0.06	1.00				
WML	−0.26**	0.04	0.01	1.00			
LQF	0.24**	0.01	0.21**	0.05	1.00		
ASI	0.02	0.05	−0.13	−0.06	0.02	1.00	
asi	0.04	0.05	−0.02	0.03	−0.02	0.12	1.00

Notes: Statistical significance at: **5 and ***10 per cent levels; [a]S&P CNX Nifty have been taken as the market index; sentiment proxies like TVR, PCR, ADR, STV, CMB, FF and CTA are taken with one month lag; the market index has been made orthogonal buy using the similar approach of equation (2) adjusted proxies are high as compared to the raw proxies reported in Panel A of Table II. However, there is ample possibility that some of the MRSP may exhibit lead-lag relationships with the aggregate market wide sentiment and some variables may reflect a shift in sentiment earlier than others (Baker and Wurgler, 2006). Therefore, it is important to accommodate the $MRSP^{\perp}$ with their relative timing. To overcome this problem before validating our final sentiment index, we first tried to construct a raw sentiment index (ASI'_m) by estimating the first principal component of the 11 $MRSP^{\perp}$ and their lags.

Thus, our first stage raw sentiment index is composed of 22 loadings indicating one for each of the current and lagged values of $MRSP^{\perp}$. After having the ASI'_m we then compute the correlation between the first stage index and the current and lagged values of each of the $MRSP^{\perp}$. Finally, we construct ASI_m with the first principal component of $MRSP^{\perp}$ with their respective lead or lag, whichever has higher correlation with the ASI'_m. Since the first principal component explains 42 per cent of the sample variance, we restrict our selves at the first principal level for extracting the common variation of $MRSP^{\perp}$. We found the correlation between the ASI_m and ASI'_m is 0.82, which suggest that we are not running the risk of loosing substantial information in dropping the 11 proxies with other time subscripts. The resulting final sentiment index can be expressed as:

$$\begin{aligned} ASI_m = {} & 0.328{*}TVR^{\perp}_{m-1} + 0.394{*}STV^{\perp}_{m-1} + 0.060{*}BSIR^{\perp}_{m} - 0.164{*}PCR^{\perp}_{m-1} \\ & + 0.194^{*}ADR^{\perp}_{m-1} + 0.209{*}NIPO^{\perp}_{m} + 0.213{*}EITI^{\perp}_{m} - 0.053{*}Div.P^{\perp}_{m} \\ & + 0.273{*}CMB^{\perp}_{m-1} + 0.025{*}FF^{\perp}_{m-1} - 0.308{*}CTA^{\perp}_{m-1} \end{aligned} \quad (3)$$

Except for *Div.P.* we found similar results as that of Baker and Wurgler (2006) for incorporating the relative timing of the $MRSP^{\perp}$ in our ASI_m, i.e. proxies that involve firm supply responses (*NIPO* and *EITI*) expected to lag behind proxies that are based directly on investor demand or investor behaviour (*PCR*, *ADR*, *STV*, *CMB*, *FF*, *CTA*, *TVR*). While Baker and Wurgler (2006) found that *Div.P.* should enter into the index with a lag, we found that in the context of India the impact of dividend premium cannot be accounted as investor demand side influence, rather it shows a contemporaneous effect.

However, as there is no theoretical argument in the prior literature as to how many implicit proxies one may consider for constructing the sentiment index, one may argue that our specified sentiment index in equation (3) may not be the best or appropriate one. Related literature in the developed markets follows the approach of Baker and Wurgler (2006, 2007) and considers six market wide sentiment proxies to construct their sentiment index. But the theoretical argument that supports the six variables may not be appropriate in the other market. For instance the variable like *Div.P.* or NIPO may not be more appropriate in the Indian market given the level of information asymmetry and primary market activity. This is also consistent with recent literature which suggests in India over the years the percentage of companies paying dividends have declined and only a few companies pay regular dividends (Pandey and Bhat, 2007). In order to check to robustness of our sentiment risk pricing we also constructed another aggregate sentiment index (*asi*) by considering only seven sentiment proxies that are having high correlation with the market index. Panel A of Table II shows that out of the 11 variables four variables (which includes three variables that has been used by Baker and Wurgler (2006, 2007) are not heavily correlated with the market index.

Following the above mentioned approach we also construct another index (*asi*) by considering seven proxies out of the 11 MRSP and can be specified as:

$$asi = 0.501{*}TVR_{m-1}^{\perp} + 0.179{*}BSIR_{m}^{\perp} - 0.176{*}PCR_{m-1}^{\perp} + 0.461{*}ADR_{m-1}^{\perp} + 0.504CMB_{m-1}^{\perp} + 0.260{*}FF_{m-1}^{\perp} - 0.386{*}CTA_{m-1}^{\perp} \quad (4)$$

Panel C Table II gives the correlation matrix of the *ASI* and *asi* with other market wide risk factors which gives an indication that our constructed proxy for sentiment risk is insignificantly related to market wide risk factors.

3. Model specification and methodology

For the present analysis we consider the five factor asset-pricing model (FFM) that augments the Carhart's (1997) four-factor model with a liquidity factor. Our approach to consider unconditional multifactor model can be viewed as an augmented version of the single-beta CAPM expressed in a multifactor ICAPM or APT setting. Following the APT and ICAPM multifactor specification suppose that returns of our test assets are generated by a L-factor linear asset-pricing model:

$$r_{pm} - r_{fm} = \alpha_p + \sum_{j=1}^{L} \beta_{pj}\left(F_{jm}\right) + \varepsilon_{pm}, \quad m = 1, \ldots, M, p = 1, \ldots, N, \quad (5)$$

where, $r_{pt} - r_{ft}$ is the excess return on portfolio over the risk-free rate, F_j is the excess return on the jth factor portfolio, β_{Pj} is portfolio P's loading on factor j. Following the similar specification FFM that augments Fama and French three factors with momentum and liquidity factor can be expressed as:

$$r_{pm} - r_{fm} = \alpha_p + \sum_{L=1}^{3} \beta_{pL} FFTFM_{Lm} + \beta_{WML_P}\left(r_{WML_m}\right) + \beta_{LQF_P}\left(r_{LQF_m}\right) + \varepsilon_{pm}, \quad m = 1, \ldots, M, p = 1, \ldots, N, \quad (6)$$

where, *FFTFM* is a vector containing return of Fama and French's three factors namely r_{MKT_m} (market excess return, i.e. $r_m - r_f$), r_{SMB_m} (returns on an SMB portfolio), r_{HML_m} (returns on an HML portfolio). r_{WML_m} and β_{WML_p}, respectively, represent the returns and factor sensitivities of test asset p to the WML portfolio. Similarly r_{LQF_m} and β_{LQF_p}, respectively, represent the returns and factor sensitivities of test asset p to the LQF portfolio.

Given our objective of validating the risk factors which are priced in Indian stock market we restrict ourselves up to the first stage time series regression. Our restriction to the first step is due to our objective of identification and validation of factors that are implicitly assumed to be priced as a rational source of risk factor. After conducting the time series asset pricing tests using the FFM we then examine the alphas (intercepts) of these regressions which are a measure of abnormal return. The proposition is that if the spread in the average returns of these portfolios is indeed a compensation for risk (at least as measured by standard risk factors), then the alpha of these portfolios should be jointly zero. In addition to individual t-test we have provided the Gibbons *et al.* (1989)

test (GRS) of the hypothesis that the alphas are jointly equals to zero. In other words the GRS test statistic tests the null hypothesis: $H_0 : \alpha_P = 0, \forall P$ which should not be rejected if the factors completely explain excess returns. The GRS test statistic has better small sample properties than the Wald, Lagrange multiplier, and likelihood ratio tests (Gibbons *et al.*, 1989). Specifically, GRS test is less likely to falsely reject the null of intercepts are all zero (Campbell *et al.*, 1997).

After examining the pricing behaviour of our five market wide risk factors we examine the importance of sentiment risk after controlling the effect of fife risk factors (MKT, SMB, HML, MOM, LIQ). In order to examine the pricing implication of market wide sentiment as a risk factor we specified the following three equations for time series regression analysis, which includes our market wide aggregate sentiment index (*ASI*) as one of the explanatory variable along with other risk factors as control variables in independent multifactor specifications:

$$r_{pm} - r_{fm} = \alpha_p + \beta_{ASI_P} ASI_{m-1} + \sum_{L=1}^{3} \beta_{pL} FFTFM_{Lm} + \varepsilon_{pm} \quad (7)$$

$$r_{pm} - r_{fm} = \alpha_p + \beta_{ASI_P} ASI_{m-1} + \sum_{L=1}^{3} \beta_{pL} FFTFM_{Lm} + \beta_{WML_P} \left(r_{WML_m} \right) + \varepsilon_{pm} \quad (8)$$

$$r_{pm} - r_{fm} = \alpha_p + \beta_{ASI_P} ASI_{m-1} + \sum_{L=1}^{4} \beta_{pL} CFFM_{Lm} + \beta_{LQF_P} \left(r_{LQF_m} \right) + \varepsilon_{pm} \quad (9)$$

where, β_{ASI_P} indicates the loading on the aggregate sentiment index (*ASI*), *FFTFM* is a vector containing excess return of Fama and French's three-factors (MKT, SMB and HML) and *CFFM* is a vector containing excess return of the Carhart (1997) four factors (MKT, SMB, HML and WML). r_{LQF_m} and β_{LQF_p}, respectively, represent the returns and factor sensitivities of test asset p to the LQF portfolio. Under the null hypothesis that stock returns are not influenced by behavioural forces, sentiment should not enter the regression significantly. Against this null, under the alternative hypothesis we argue that since optimism or a bullish sentiment drives stock prices above the fundamental values and thus sentiment will have a negative impact on stock return and the coefficient of ASI_{m-1} should be negative and statistically significant. In other words, since positive sentiment results in over valuation of stocks the future returns over the time period will be lower.

4. Discussion of results

Table III presents the results of multivariate time series regression results of equation (6). The adjusted R^2 values have been reasonably high supporting the fact that to some extent FFM is capable to capture the common variation in stock returns. The reported GRS statistics which tests the null that the alphas are jointly zero cannot be rejected. The results in Table III indicate that the market factor has been priced significantly, irrespective of SZ-LIQ-BME-MOM group. Our result supports the pervasive and significant market risk factor even in the presence of liquidity and other factors. It is also evident that coefficient of SMB factor decreases as SZ increases, and the coefficient on the HML factor increases as BME increases. Consistent with the results of Fama and French (1993) and Keene and Peterson (2007) our results also validate that undoubtedly SMB and HML

$$r_{pm} - r_{fm} = \alpha_p + \sum_{L=1}^{3} \beta_{pL} FFTFM_{Lm} + \beta_{WML_P}(r_{WML_m}) + \beta_{LQF_P}(r_{LQF_m}) + \varepsilon_{pm}$$

Portfolio groups	Momentum (MOM)											
	α_P			β_{m_P}			β_{SMB_P}			β_{HML_P}		
	L	*N*	*W*	*L*	*N*	*W*	*L*	*N*	*W*	*L*	*N*	*W*
P1/1/1	−1.51**	−1.59**	0.15	0.83*	0.77*	0.96*	0.98*	0.85*	0.98*	0.49*	0.37*	0.52*
	(−1.95)	(−2.15)	(0.16)	(9.68)	(9.42)	(9.27)	(11.57)	(10.49)	(9.54)	(6.39)	(5.08)	(5.65)
P1/1/2	−0.02	−0.54	0.16	0.89*	0.82*	0.80*	1.08*	1.03*	1.23*	0.52*	0.55*	0.67*
	(0.00)	(−0.60)	(0.17)	(9.43)	(8.23)	(7.72)	(11.62)	(10.46)	(11.96)	(6.19)	(6.22)	(7.28)
P1/2/1	−1.73***	−0.90	0.44	0.88*	0.84*	1.01*	0.92*	0.93*	0.86*	0.41*	0.47*	0.41*
	(−1.89)	(−1.04)	(0.48)	(8.67)	(8.75)	(9.97)	(9.23)	(9.74)	(8.59)	(4.51)	(5.52)	(4.52)
P1/2/2	−1.44	−1.89**	−1.01	0.85*	0.77*	0.82*	1.19*	1.16*	0.91*	0.60*	0.62*	0.42*
	(−1.47)	(−2.05)	(−1.08)	(7.85)	(7.58)	(7.90)	(11.11)	(11.54)	(8.88)	(6.21)	(6.80)	(4.51)
P2/1/1	−1.66**	−1.05	−0.20	0.79*	0.81*	0.91*	0.57*	0.50*	0.61*	0.23*	0.23*	0.31*
	(−2.31)	(0.12)	(0.81)	(9.90)	(10.80)	(9.88)	(7.21)	(6.71)	(6.67)	(3.28)	(3.53)	(3.74)
P2/1/2	−0.36	−0.68	0.10	0.87*	0.81*	0.89*	0.80*	0.68*	0.58*	0.39*	0.34*	0.29*
	(0.65)	(0.39)	(0.89)	(9.83)	(9.17)	(10.87)	(9.07)	(7.80)	(7.14)	(4.98)	(4.40)	(3.98)
P2/2/1	−0.76	−1.04	−0.33	0.87*	0.80*	0.91*	0.58*	0.67*	0.70*	0.23*	0.35*	0.27*
	(0.36)	(0.24)	(0.72)	(9.56)	(8.23)	(8.98)	(6.41)	(6.94)	(6.96)	(2.80)	(3.97)	(3.04)
P2/2/2	−0.07	0.44	0.94	0.86*	0.96*	0.90*	0.71*	0.55*	0.63*	0.39*	0.24	0.32*
	(0.95)	(0.49)	(0.98)	(8.09)	(9.60)	(8.52)	(6.76)	(5.51)	(6.05)	(4.09)	(2.74)	(3.38)
P3/1/1	−2.11*	−1.55*	−0.27	0.70*	0.70*	0.88*	0.29*	0.21*	0.16**	0.07	0.08	0.03
	(−3.29)	(−2.64)	(−0.38)	(9.91)	(10.86)	(11.11)	(4.17)	(3.34)	(2.02)	(1.17)	(1.41)	(0.49)
P3/1/2	−0.04	−0.84	0.55	0.87*	0.80*	0.99*	0.30*	0.36*	0.25*	0.04	0.13***	0.15**
	(−0.05)	(−1.18)	(0.73)	(10.56)	(10.21)	(11.86)	(3.60)	(4.67)	(3.08)	(0.57)	(1.80)	(2.05)
P3/2/1	−0.41	−0.39	0.96	0.91*	0.88*	1.02*	0.11	0.19**	0.08	0.04	0.01	0.05
	(−0.56)	(−0.53)	(1.18)	(11.23)	(10.76)	(11.33)	(1.32)	(2.27)	(0.92)	(0.52)	(0.12)	(0.58)
P3/2/2	−0.03	0.05	1.15	0.85*	0.82*	0.94*	0.37*	0.25*	0.29*	0.14	0.10	0.16**
	(0.98)	(0.94)	(0.15)	(8.98)	(10.15)	(10.67)	(3.97)	(3.08)	(3.26)	(1.62)	(1.45)	(2.04)

	β_{WML_P}			β_{LQF_P}			$Adj.\ R^2$		
	L	*N*	*W*	*L*	*N*	*W*	*L*	*N*	*W*
P1/1/1	−0.02	−0.02	0.01	−0.17	−0.15	−0.22	0.62	0.59	0.54
	(−1.43)	(−1.48)	(−1.36)	(−0.98)	(−0.92)	(−1.05)			
P1/1/2	−0.03**	0.01	−0.02	−0.28	−0.08	−0.22	0.62	0.54	0.57
	(−2.27)	(−0.10)	(−1.26)	(−1.44)	(−0.40)	(−0.06)			

(*continued*)

Table III.
Regression of excess portfolio returns on FFM

Table III.

$$r_{pm} - r_{fm} = \alpha_p + \sum_{L=1}^{3} \beta_{pL} FFTFM_{Lm} + \beta_{WML_P}(r_{WML_m}) + \beta_{LQF_P}(r_{LQF_m}) + \varepsilon_{pm}$$

Portfolio groups				Momentum (MOM)					
P1/2/1	−0.03**	−0.01	0.00	−0.57*	−0.66*	−0.82*	0.55	0.55	0.57
	(−2.01)	(−0.46)	(−0.20)	(−2.76)	(−3.96)	(−4.00)			
P1/2/2	−0.02	−0.03**	−0.02	−0.92*	−0.71*	−0.52*	0.57	0.58	0.51
	(−1.24)	(−1.97)	(−1.22)	(−4.18)	(−3.40)	(−2.46)			
P2/1/1	−0.02	−0.02**	−0.01	−0.15	−0.12	−0.36***	0.53	0.54	0.50
	(−1.40)	(−2.10)	(−2.10)	(−0.90)	(−0.82)	(−1.93)			
P2/1/2	−0.04*	−0.03**	−0.01	−0.15	−0.19	−0.05	0.58	0.51	0.54
	(−3.09)	(−2.13)	(−0.63)	(−0.86)	(−1.07)	(−0.42)			
P2/2/1	−0.03**	−0.03**	−0.01	−1.01*	−0.52*	−0.97*	0.55	0.47	0.52
	(−2.38)	(−2.12)	(−0.36)	(−5.45)	(−2.64)	(−4.71)			
P2/2/2	−0.04	−0.02	−0.02	−0.72*	−0.45**	−0.71*	0.47	0.48	0.46
	(−0.36)	(−1.62)	(−1.43)	(−3.33)	(−2.23)	(−3.31)			
P3/1/1	−0.04*	−0.03*	−0.01	−0.12	−0.10	−0.46*	0.50	0.50	0.49
	(−3.53)	(−2.94)	(−0.91)	(−0.87)	(−0.76)	(−2.86)			
P3/1/2	−0.04*	−0.03*	−0.01	−0.42**	−0.14	0.03	0.52	0.50	0.49
	(−3.12)	(−2.61)	(−0.55)	(−2.51)	(−0.89)	(0.20)			
P3/2/1	−0.03*	−0.02**	−0.01	−0.75*	−0.51*	−1.12*	0.52	0.50	0.54
	(−2.84)	(−2.05)	(−0.51)	(−4.55)	(−3.06)	(−6.09)			
P3/2/2	−0.04*	−0.02	−0.02	−0.74*	−0.55*	−0.82*	0.48	0.47	0.50
	(−3.30)	(−1.51)	(−1.51)	(−3.86)	(−3.32)	(−4.54)			
GRS	5.38 (p-val. 2.01)								

Notes: Statistical significance at: *1, **5 and ***10 per cent levels; this table represents coefficients of time series regression of excess stock returns on FFM (equation (4)); sample period consists of 187 monthly observations (September 1995 to March 2011); the 36 SZ-LIQ-BME-MOM portfolios are formed using three size, two liquidity, two book-to-market equity and three momentum groups; for the purpose of brevity we report the portfolio groups of SZ/LIQ/BME/MOM as Pi/j/k-L, Pi/j/k-N, Pi/j/k-W; the first subscript in the portfolio notation Pi/j/k represents the three SZ trisects, for, e.g. small (1), medium (2), large (3); the second subscript denotes the two LIQ bisects, for, e.g. low (1), high (2); similarly the third subscript represents the two BME bisects, for, e.g. low (1), high (2); the subscripts L, N and W represents the momentum trisects as looser (L), neutral (N) and winner (W), respectively; MKT is the market factor, SMB is the size factor, HML is the book-to-market factor, WML is the short run momentum factors, LQF is the liquid factor (difference between the return on a portfolio of low liquid stocks and the return on a portfolio of high liquid stocks); the t-statistics (reported in parentheses) have been corrected for the effects of hetroskedasticity and autocorrelation using the method of Newey and West (1987) are systematically related to size and BME characteristics and represent the shared variation in stock returns. However, in contrast to Fama and French (1993) we found a significant positive HML slope for small and medium size groups, but positive insignificant in case of large size groups. This is inconsistent with the relative distress effect argument of high BME stocks (Fama and French, 1992). Our results suggest that although BME is priced in the Indian stock market but the argument of relative distress as a priced source of risk is abysmal for Indian large size companies.

The coefficient of WML has been priced significantly for the looser stock portfolios and loses its statistical significance in case of winner stock portfolios. In other words, the momentum strategy retains its value only for the sell side transactions (losers). This is quite contradicting with Jegadeesh and Titman (1993, 2001) findings that debate on the significance of pervasive momentum profits in both buy and sell strategies. However, our results suggest that momentum profits come from the short side of the transaction and not from the long side of the transaction. However, the choice of WML as a priced risk factor never looks good to favour the pricing of winner stocks portfolios as compared to the their looser counterparts. One possible reason for the presence of such under reaction hypothesis in case of loser stocks may be attributed to their low analyst coverage and their presence as small stocks.

More evidently, we found that liquidity is priced and explains shared variation in returns but our LQF factor priced negatively across all the portfolio characteristics which indicate that there is a liquidity premium in case of Indian stock market. However, the frequency of statistical significance is considerably greater for the large stocks and for high BME groups. Our results are contradictory to that of Amihud (2002), Keene and Peterson (2007) and Liu (2006) for US and Lam and Tam (2011) for Hong Kong market as we do not find any variation in terms of positive or negative pricing pattern of liquidity across size groups. The negative relationship between liquidity and excess return supports the fact that due to less liquidity investors can reasonably expect to be compensated with larger returns for the risk that they will not be able to sell a stock in a timely fashion without undue loss (Marshall and Young, 2003). Another plausible explanation is that because of the high concentration of promoter holding in Indian companies the large size stocks may not have the same amount of market liquidity as it is expected to be. Given these results, one might conclude that the local FFM is reasonable but may not be absolute solution for explaining the cross section of stock return.

Table IV represents the results of sentiment augmented multifactor models as specified in equations (7)-(9), respectively. For the purpose of brevity we have only reported the slope coefficient of the sentiment factor (*ASI*) and the respective intercepts and the results for the other market wide risk factors are consistent with our prior analysis. From the results we found that stocks with characteristics such as small size, low LIQ, low BME and losers are affected with the sentiment risk. These findings have been consistent with the argument that small stocks and stocks those are hard to value and riskier to arbitrage are more profoundly expected to be influenced by sentiment factor (Baker and Wurgler, 2006, 2007). Although in case of three factor model specification large size, low LIQ, low BME across all the momentum portfolios have shown significant pricing of sentiment risk, but as we add more market risk factors in the four and FFM specifications the sentiment pricing gradually looses its importance.

Table IV.
Regression of excess portfolio returns on sentiment augmented multifactor models

Portfolio groups	Momentum (MOM)											
	L	*N*	*W*	*L*	*N*	*W*	*L*	*N*	*W*	*L*	*N*	*W*
	(1) $r_{pm} - r_{fm} = \alpha_p + \beta_{ASI_P} ASI_{m-1} + \sum_{L=1}^{3} \beta_{pL} FFTFM_{Lm} + \varepsilon_{pm}$						(2) $r_{pm} - r_{fm} = \alpha_p + \beta_{ASI_P} ASI_{m-1} + \sum_{L=1}^{3} \beta_{pL} FFTFM_{Lm} + \beta_{WML_P}(r_{WML_m}) + \varepsilon_{pm}$					
	α_P			β_{ASI_P}			α_P			β_{ASI_P}		
P1/1/1	−0.77	−0.49	−0.03	−0.25**	−0.12	−0.12	−0.04	0.21	0.21	−0.21**	−0.08	−0.17
	(−0.84)	(−0.64)	(−0.04)	(−2.32)	(−1.33)	(−1.33)	(−0.04)	(0.27)	(0.22)	(−2.01)	(−0.96)	(−1.59)
P1/1/2	0.37	0.25	0.99	−0.27**	−0.18	−0.18	1.52	1.09	1.32	−0.21***	−0.14	−0.16
	(0.37)	(0.26)	(1.05)	(−2.27)	(−1.57)	(−1.57)	(1.53)	(1.08)	(1.33)	(−1.87)	(−1.23)	(−1.42)
P1/2/1	−1.29	−0.78	0.20	−0.21	−0.15	−0.15	−0.11	−0.29	0.99	−0.15	−0.13	−0.08
	(−1.13)	(−0.78)	(0.18)	(−1.53)	(−1.31)	(−1.31)	(−0.09)	(−0.28)	(0.82)	(−1.13)	(−1.09)	(−0.60)
P1/2/2	−2.04	−1.29	−0.59	−0.14	−0.14	−0.14	−0.50	−0.35	−0.35	−0.06	−0.09	−0.12
	(−1.67)	(−1.15)	(−0.55)	(−0.99)	(−1.03)	(−1.03)	(−0.43)	(−0.30)	(−0.31)	(−0.48)	(−0.68)	(−0.96)
P2/1/1	−0.55	−0.30	1.11	−0.15	−0.12	−0.12	0.27	0.24	1.31	−0.11	−0.09	−0.11
	(−0.66)	(−0.36)	(1.18)	(−1.56)	(−1.19)	(−1.19)	(0.31)	(0.27)	(1.32)	(−1.17)	(−0.91)	(−0.94)
P2/1/2	0.15	0.59	0.99	−0.19***	−0.18**	−0.18**	1.16	1.18	1.28	−0.14	−0.15	−0.20***
	(0.16)	(0.64)	(1.12)	(−1.72)	(−2.08)	(−2.08)	(1.22)	(1.24)	(1.39)	(−1.32)	(−1.36)	(−1.91)
P2/2/1	−0.38	0.02	−0.06	−0.19	−0.14	−0.14	0.43	0.18	0.21	−0.15	−0.13	−0.14
	(−0.37)	(0.02)	(−0.06)	(−1.12)	(−1.34)	(−1.34)	(0.41)	(0.16)	(0.20)	(−1.30)	(−1.03)	(−1.21)
P2/2/2	−0.05	0.22	1.48	−0.11	−0.18	−0.18	1.12	1.09	1.84	−0.05	−0.13	−0.12
	(−0.04)	(0.20)	(1.13)	(−0.73)	(−1.39)	(−1.39)	(0.90)	(0.97)	(1.33)	(−0.33)	(−1.06)	(−0.78)
P3/1/1	−0.96	−0.60	0.72	−0.18**	−0.17**	−0.17**	−0.45	−0.25	0.81	−0.15***	−0.15***	−0.16***
	(−1.34)	(−0.88)	(0.88)	(−2.10)	(−2.29)	(−2.29)	(−0.62)	(−0.35)	(0.94)	(−1.81)	(−1.91)	(−1.67)
P3/1/2	0.43	0.63	0.97	−0.15**	−0.15***	−0.15***	1.14	1.20	1.16	−0.12	−0.12	−0.13
	(0.47)	(0.72)	(1.08)	(−2.13)	(−1.75)	(−1.75)	(1.20)	(1.34)	(1.21)	(−1.10)	(−1.15)	(−1.19)
P3/2/1	0.35	0.17	0.70	−0.15	−0.18	−0.18	1.21	0.24	0.95	−0.11	−0.18	−0.16
	(0.37)	(0.19)	(0.70)	(−1.32)	(−1.78)	(−1.78)	(1.23)	(0.26)	(0.91)	(−0.96)	(−1.72)	(−1.35)
P3/2/2	0.52	0.33	1.14	−0.25**	−0.18	−0.18	1.40	0.69	1.73***	−0.20***	−0.16	−0.10
	(0.50)	(0.33)	(1.13)	(−2.01)	(−1.53)	(−1.53)	(1.31)	(0.66)	(1.64)	(−1.68)	(−1.36)	(−0.82)

(*continued*)

Table IV.

Portfolio groups	Momentum (MOM)					
	L	N	W	L	N	W
	(3) $r_{pm} - r_{fm} = \alpha_p + \beta_{ASI_p} ASI_{m-1} + \sum_{L=1}^{4} \beta_{pL} CFFM_{Lm} + \beta_{LQF_P}(r_{LQF_m}) + \varepsilon_{pm}$					
	α_P			β_{ASI_p}		
P1/1/1	−0.03	0.22	0.21	−0.22**	−0.09	−0.17
	(−0.04)	(0.28)	(0.23)	(−2.02)	(0.32)	(−1.60)
P1/1/2	1.53	1.09	1.35	−0.21***	−0.14	−0.17
	(1.53)	(1.08)	(1.38)	(−1.88)	(−1.23)	(−1.57)
P1/2/1	−0.08	−0.25	1.06	−0.16	−0.15	−0.12
	(−0.07)	(−0.24)	(0.93)	(−1.24)	(−1.28)	(−0.89)
P1/2/2	−0.46	−0.31	−0.32	−0.08	−0.11	−0.14
	(−0.40)	(−0.27)	(−0.28)	(−0.64)	(−0.86)	(−1.10)
P2/1/1	0.28	0.25	1.32	−0.12	−0.10	−0.11
	(0.33)	(0.29)	(1.36)	(−1.04)	(−1.24)	(−1.00)
P2/1/2	1.17	1.18	1.29	−0.15	−0.15	−0.20***
	(1.22)	(1.23)	(1.39)	(−0.96)	(−1.34)	(−1.94)
P2/2/1	0.48	0.21	0.26	−0.18	−0.14	−0.17
	(0.47)	(0.19)	(0.24)	(−1.54)	(−1.15)	(−1.49)
P2/2/2	1.17	1.13	1.88	−0.07	−0.15	−0.14
	(0.96)	(1.02)	(1.37)	(−0.52)	(−1.22)	(−0.91)
P3/1/1	−0.44	−0.26	0.82	−0.16***	−0.15***	−0.17***
	(−0.60)	(−0.36)	(0.95)	(−1.87)	(−1.87)	(−1.73)
P3/1/2	1.16	1.21	1.16	−0.13***	−0.12	−0.13
	(1.24)	(1.35)	(1.21)	(−1.73)	(−1.23)	(−1.19)
P3/2/1	1.24	0.27	0.99	−0.13	−0.19	−0.18***
	(1.30)	(0.29)	(0.68)	(−1.21)	(−1.15)	(−1.85)
P3/2/2	1.43	0.71	1.77***	−0.22***	−0.17***	−0.12
	(1.36)	(0.69)	(1.73)	(−1.60)	(−1.86)	(−1.46)

Notes: Statistical significance at: *1, **5 and ***10 per cent levels; this table represents slope and intercept of regression results of portfolio returns on sentiment augmented unconditional multifactor models (Fama and French three factor model, Carhart four factor model and FFM). (1) (2) and (3) represents the regression results of equations (7)-(9), respectively; sample period consists of 98 monthly observations (January 2003 to March 2011); the 36 SZ-LIQ-BME-MOM portfolios are formed using three size, two liquidity, two book-to-market equity and three momentum groups; for the purpose of brevity we report the portfolio groups of SZ/LIQ/BME/MOM as Pi/j/k-L, Pi/j/k-N, Pi/j/k-W; the first subscript in the portfolio notation Pi/j/k represents the three SZ trisects, for, e.g. small (1), medium (2), large (3); the second subscript denotes the two LQF bisects, for, e.g. low (1), high (2); similarly the third subscript represents the two BME bisects, for, e.g. low (1), high (2); the subscripts L, N and W represents the momentum trisects as looser (L), neutral (N) and winner (W), respectively. *ASI* indicates the aggregate sentiment index as described in Section 2.2; the *t*-statistics (reported in parentheses) have been corrected for the effects of hetroskedasticity and autocorrelation using the method of Newey and West (1987)

This gives an impression that the FFTFM may be validated with caution in Indian stock market as it fails to capture the impact of sentiment risk to some extent. Our results also suggest that the magnitude of pricing implication for the market wide risk factors as reported in Table IV gives an impression of the rational sources of priced risk. Similarly there is also a consistent pattern of sentiment pricing on the large size, low liquid and low book-to-market stocks across the three momentum characteristics. This consistent pattern can also be observed after controlling the importance of momentum and liquidity factors. Across the size characteristics the stocks that have shown the nature of high book-to-market equity and high liquidity show a sparse evidence of sentiment risk pricing. As evident from the Table I in our sample stocks there is a potential presence of large numbers of small and low liquid stocks in the market, the pricing of sentiment risk across the small and low liquid stocks gives a hint that with contrarian investment strategy, here is apparent possibility to gain excess return from these stock when the market follows a downward trend.

Table V reports the results of our second sentiment index (*asi*) augmented multifactor models following the similar specification of equations (7)-(9). Similar to the results reported in Table IV stocks with characteristics such as small size, low LIQ, low BME are significantly priced with the sentiment risk. However, in contrast to the results for *ASI* results in Table V also suggest the sentiment pricing in case of large size, growth and winner stocks. The most prominent outcome from the use of *asi* is related to the significant intercepts across all the multifactor model specifications. This indicates the missing risk factor hypothesis can be ruled out while considering the sentiment risk for the cross section of stock return explanations. In aggregate level results of Tables IV and V suggest that the pricing of sentiment risk is significant for small and growth stocks, large size winner stocks, small size looser stocks, small size low liquid stocks and large size high liquid stocks. Similar to the results reported in Table IV the FFM retains its explanatory power as compared to FFTFM and CFFM in the presence of sentiment risk.

However, the minimal pricing implication of market wide sentiment risk in the context of Indian stock market for several other portfolios may be because of the following reasons. This may be because of the some special characteristics of Indian stock mark. With the low level of retail investor participation, high promoter holding and large portion of institutional investors' contribution towards the entire market turnover might lead to a different reaction of stock returns to investor sentiment. Another possible reason for our deviation from existing behavioural asset pricing literature may be because of our value weighted portfolio characterisation and one year holding period restriction. Nevertheless, even though recent literature suggests that institutional investors are more rational as compared to the individual investors (Verma and Verma, 2009), our results suggest that in a market dominated by institutional investors' sentiment risk pricing is also evident one.

5. Summary and conclusions

Our findings support that the applicability of unconditional five factor pricing model as reasonable but may not be absolute solution for applications to portfolios in Indian stock market. It may not be absolute because of the resulted non zero intercept across all the portfolios. In contrast to Fama and French (1996) we found that Fama and French factors retains their importance while explaining the return on momentum

Portfolio groups	Momentum (MOM)											
	L	N	W	L	N	W	L	N	W	L	N	W
	(1) $r_{pm}-r_{fm}=\alpha_p+\beta_{asi_p}asi_{m-1}+\sum_{L=1}^{3}\beta_{pL}FFTFM_{Lm}+\varepsilon_{pm}$						(2) $r_{pm}-r_{fm}=\alpha_p+\beta_{asi_p}asi_{m-1}+\sum_{L=1}^{3}\beta_{pL}FFTFM_{Lm}+\beta_{WML_P}(r_{WML_m})+\varepsilon_{pm}$					
	α_P			β_{asi_P}			α_P			β_{asi_P}		
P1/1/1	4.57*	4.84*	5.30*	−2.54*	−0.69	−2.14*	5.30*	5.51*	5.53*	−2.51*	−0.67	−2.13*
	(5.41)	(6.76)	(6.48)	(−4.70)	(−1.38)	(−4.09)	(6.18)	(7.63)	(6.42)	(−4.79)	(−1.41)	(−4.06)
P1/1/2	5.71*	5.59*	6.33*	−2.10*	−0.95	−2.13*	6.87*	6.40*	6.65*	−2.04*	−0.94	−2.11*
	(5.88)	(6.06)	(7.10)	(−3.37)	(−1.48)	(−3.72)	(7.23)	(6.84)	(7.10)	(−4.54)	(−1.51)	(−3.03)
P1/2/1	4.05*	4.56*	5.54*	−1.02	−0.31	−2.14*	5.20*	5.01*	6.28*	−1.00	−0.30	−1.58**
	(3.81)	(5.37)	(5.02)	(−1.33)	(−0.46)	(−3.03)	(4.94)	(5.66)	(5.51)	(−1.38)	(−0.45)	(−2.15)
P1/2/2	3.30*	4.05*	4.75*	−2.78*	−1.09	−0.94	4.78*	4.94*	4.95*	−2.70*	−1.07	−0.96
	(2.89)	(4.00)	(4.97)	(−3.79)	(−1.47)	(−1.80)	(4.34)	(4.82)	(4.91)	(−4.61)	(−1.50)	(−1.64)
P2/1/1	4.78*	5.04*	6.44*	−0.44	−0.56	−0.62	5.57*	5.53*	6.61*	−0.43	−0.55	−0.61
	(6.35)	(6.76)	(7.52)	(−0.81)	(−1.40)	(−1.01)	(7.42)	(7.18)	(7.31)	(−0.82)	(−1.03)	(−1.00)
P2/1/2	5.49*	5.93*	6.32*	−2.23*	−2.18*	−1.26	6.48*	6.50*	6.62*	−2.18*	−0.91	−0.24
	(6.23)	(7.12)	(7.81)	(−3.94)	(−4.09)	(−1.62)	(7.44)	(7.56)	(7.79)	(−4.42)	(−1.57)	(−1.13)
P2/2/1	4.96*	5.36*	5.28*	−0.74	−0.76	−0.99	5.75*	5.49*	5.52*	−0.73	−0.76	−0.49
	(5.37)	(5.58)	(5.69)	(−1.12)	(−1.12)	(−1.50)	(6.12)	(5.42)	(5.65)	(−1.13)	(−1.11)	(−1.49)
P2/2/2	5.29*	5.56*	6.82*	−2.54*	−1.26***	−0.18	6.39*	6.40*	7.15*	−2.49*	−1.24	−1.52
	(4.56)	(5.50)	(5.36)	(−3.42)	(−1.88)	(−1.56)	(5.47)	(6.21)	(5.34)	(−4.38)	(−1.82)	(−1.77)
P3/1/1	4.38*	4.73*	6.05*	−1.80**	−0.38	−1.98**	4.87*	5.07*	6.14*	−1.78**	−1.37	−0.52
	(6.74)	(7.45)	(8.07)	(−2.26)	(−0.84)	(−2.39)	(7.30)	(7.67)	(7.74)	(−2.19)	(1.68)	(−0.96)
P3/1/2	5.77*	5.96*	6.31*	−2.28*	−0.76	−2.39*	6.44*	6.51*	6.47*	−2.25*	−0.75	−2.39*
	(6.84)	(7.41)	(7.76)	(−4.22)	(−1.13)	(−4.59)	(7.47)	(7.85)	(7.54)	(−4.56)	(−1.34)	(−3.87)
P3/2/1	5.35*	5.50*	6.03*	−1.74**	−0.35	−2.32*	6.15*	5.57*	6.27*	−1.66***	−0.35	−0.77
	(2.16)	(6.92)	(6.48)	(−2.29)	(−0.76)	(−3.90)	(2.26)	(6.63)	(6.39)	(−1.98)	(−0.60)	(−1.18)
P3/2/2	5.86*	5.66*	6.48*	−2.41*	−1.20***	−2.46*	6.74*	6.01*	7.03*	−2.37*	−1.20	−2.43*
	(5.94)	(6.29)	(6.97)	(−3.81)	(−1.89)	(−4.13)	(6.73)	(6.35)	(7.28)	(−3.88)	(−1.49)	(−4.13)

(continued)

Table V.
Regression of excess portfolio returns on sentiment (second sentiment index) augmented multifactor models

Table V.

$$r_{pm} - r_{fm} = \alpha_p + \beta_{asi_p} asi_{m-1} + \sum_{L=1}^{4} \beta_{pL} CFFM_{Lm} + \beta_{LQF_P}(r_{LQF_m}) + \varepsilon_{pm} \quad (3)$$

Portfolio groups	Momentum (MOM)					
	L	N	W	L	N	W
	α_P			β_{asi_p}		
P1/1/1	5.31*	5.52*	5.54*	−2.51*	−0.65	−2.14*
	(6.16)	(7.62)	(6.40)	(−4.78)	(−1.32)	(−4.05)
P1/1/2	6.87*	6.41*	6.69*	−2.04*	−0.96	−1.20***
	(7.20)	(6.81)	(7.24)	(−3.51)	(−1.51)	(−1.92)
P1/2/1	5.24*	5.06*	6.36*	−0.83	−0.02	−2.16*
	(5.01)	(5.91)	(5.95)	(−1.13)	(−0.06)	(−4.89)
P1/2/2	4.83*	4.99*	4.99*	−2.73*	−0.79	−1.06
	(4.47)	(5.01)	(5.03)	(−4.64)	(−1.10)	(−123)
P2/1/1	5.59*	5.55*	6.62*	−0.35	−0.45	−0.59
	(7.45)	(7.24)	(7.29)	(−0.65)	(−0.81)	(−0.94)
P2/1/2	6.49*	6.50*	6.63*	−2.19*	−0.95	−0.55
	(7.42)	(7.52)	(7.77)	(−4.67)	(−1.60)	(−1.00)
P2/2/1	5.80*	5.52*	5.59*	−0.41	−0.58	−0.59
	(6.44)	(5.50)	(6.03)	(−0.64)	(−0.83)	(−0.95)
P2/2/2	6.45*	6.45*	7.20*	−0.50	−1.02	−0.60
	(5.70)	(6.37)	(5.42)	(−1.00)	(−1.47)	(−1.49)
P3/1/1	4.88*	5.07*	6.15*	−1.79**	−0.42	−0.62
	(7.32)	(7.62)	(7.76)	(−2.21)	(−0.90)	(−0.81)
P3/1/2	6.48*	6.52*	6.48*	−2.27*	−0.71	−1.30
	(7.61)	(7.84)	(7.51)	(−4.38)	(−1.23)	(−1.49)
P3/2/1	2.05*	5.60*	6.33*	−1.74**	−0.18	−0.45
	(2.24)	(6.75)	(6.70)	(−2.36)	(0.30)	(−0.69)
P3/2/2	6.78*	6.04*	7.08*	−2.40*	−1.07	−2.47*
	(6.91)	(6.43)	(7.63)	(−4.00)	(−1.65)	(−4.35)

Notes: Statistical significance at: *1, **5 and ***10 per cent levels; this table represents slope and intercept of regression results of portfolio returns on sentiment augmented unconditional multifactor models (Fama and French three factor model, Carhart four factor model and FFM); (1) (2) and (3) represents the regression results of equations (7)-(9), respectively; sample period consists of 98 monthly observations (January 2003 to March 2011); the 36 SZ-LIQ-BME-MOM portfolios are formed using three size, two liquidity, two book-to-market equity and three momentum groups; for the purpose of brevity we report the portfolio groups of SZ/LIQ/BME/MOM as Pi/j/k-L, Pi/j/k-N, Pi/j/k-W; the first subscript in the portfolio notation Pi/j/k represents the three SZ trisects, for, e.g. small (1), medium (2), large (3); the second subscript denotes the two LQF bisects, for, e.g. low (1), high (2); similarly the third subscript represents the two BME bisects, for, e.g. low (1), high (2); the subscripts L, N and W represents the momentum trisects as looser (L), neutral (N) and winner (W), respectively; *asi* indicates the second aggregate sentiment index measured with the selected MRSP is based on the high correlation of such proxies with the market index (S&P CNX Nifty); all other procedure for constructing the index is same as that of our main aggregate sentiment index (*ASI*) as described in Section 2.2; the *t*-statistics (reported in parentheses) have been corrected for the effects of hetroskedasticity and autocorrelation using the method of Newey and West (1987) portfolios as long as the test assets are not tilted towards the large size stocks. Our results suggest that a liquidity risk factor plays a relevant role in explaining the cross section of average return in India. However, in contrast to several literature our results do not so any such variation of its pricing nature across the size groups. Our results also contradicts to the distress risk argument of high-minus low book-to-market equity factor as in Fama and French (1993, 1996, p. 77).

Following the argument of behavioural asset pricing literature towards the pricing of market wide sentiment risk we have examined the pricing of sentiment risk in the presence of other market wide risk factors. Although it is remain inconclusive as to which and how many variables one can consider as a potential candidate for capturing the sentiment risk, but our results gives an out of sample evidence with respect to construction of sentiment index by using the implicit proxies. With respect to the construction of the aggregate sentiment index, two of our newly introduced variables like turnover volatility ratio, buy sell imbalance ratio can be considered as two additional proxies for measuring investor sentiment in a bottom-up approach. We found market wide risk factors resume their importance as rational source of priced risk. Our results also suggest that the universal pricing implication of sentiment risk in a multifactor model framework hold good even with the special nature of Indian stock market with high promoter holding and marginal retail investor participation. In particular we find that pricing of sentiment risk is significant for small and growth stocks, large size winner stocks, small size looser stocks, small size low liquid stocks and large size high liquid stocks. However, our results suggest that Fama and French (1993) three factor model fails to capture the aggregate impact of sentiment risk as compared to the FFM. The increasing significant intercepts with the inclusion of sentiment risk gives suggestive evidence towards the importance of sentiment risk as the missing risk factor in explaining the stock return and the risk factors can never be considered as the sole determinant of stock return behaviour.

Notes

1. Although prior literature suggest for different measures of liquidity, following Keene and Peterson (2007) and Lam and Tam (2011), we use turnover ratio as our main proxy for liquidity, and respective test asset portfolios along with market wide liquidity risk factor has been formed based on the turnover ratio.
2. World Federation of Exchanges (www.world-exchanges.org).

References

Amihud, Y. (2002), "Illiquidity and stock returns: cross-section and time-series effects", *Journal of Financial Markets*, Vol. 5 No. 1, pp. 31-56.

Baker, M. and Wurgler, J. (2006), "Investor sentiment and the cross-section of stock returns", *Journal of Finance*, Vol. 61 No. 4, pp. 1645-80.

Baker, M. and Wurgler, J. (2007), "Investor sentiment in the stock market", *Journal of Economic Perspective*, Vol. 21 No. 2, pp. 129-51.

Banz, R.W. (1981), "The relationship between return and market value of common stocks", *Journal of Financial Economics*, Vol. 9 No. 1, pp. 3-18.

Barberis, N. and Thaler, R.H. (2003), "A survey of behavioural finance", *Handbook of the Economics of Finance*, Chapter 18, Elsevier, North Holland.

Barberis, N., Shleifer, A. and Vishny, R. (1998), "A model of investor sentiment", *Journal of Financial Economics*, Vol. 49 No. 3, pp. 307-43.

Bekaert, G. and Harvey, R.C. (2003), "Emerging markets finance", *Journal of Empirical Finance*, Vol. 10 Nos 1/2, pp. 3-55.

Black, F. (1986), "Noise", *Journal of Finance*, Vol. 41 No. 3, pp. 529-43.

Breeden, D. (1979), "An intertemporal asset pricing model with stochastic consumption and investment opportunities", *Journal of Financial Economics*, Vol. 7 No. 3, pp. 265-96.

Brown, G.W. and Cliff, M.T. (2004), "Investor sentiment and the near-term stock market", *Journal of Empirical Finance*, Vol. 11 No. 1, pp. 1-27.

Brown, G.W. and Cliff, M.T. (2005), "Investor sentiment and asset valuation", *Journal of Business*, Vol. 78 No. 2, pp. 405-40.

Campbell, J.Y. (2000), "Asset pricing at the millennium", *Journal of Finance*, Vol. 55 No. 4, pp. 1515-67.

Campbell, J.Y., Lo, A. and MacKinlay, A.C. (1997), *The Econometrics of Financial Markets*, Princeton University Press, Princeton, NJ.

Carhart, M.M. (1997), "On persistence in mutual fund performance", *Journal of Finance*, Vol. 52 No. 1, pp. 57-82.

Claessens, S., Dasgupta, S. and Glen, J. (1995), "Return behaviour in emerging stock markets", *World Bank Economic Review*, Vol. 9 No. 1, pp. 131-51.

Claessens, S., Dasgupta, S. and Glen, J. (1998), "The cross section of stock returns: evidence from the emerging markets", *Emerging Market Quarterly*, Vol. 9 No. 1, pp. 4-13.

Daniel, K., Hirshleifer, D. and Subrahmanyam, A. (1998), "Investor psychology and security market under and overreactions", *Journal of Finance*, Vol. 53 No. 6, pp. 1839-85.

DeLong, J., Bradford, A.S., Lawrence, H.S. and Robert, J.W. (1990), "Noise trader risk in financial markets", *Journal of Political Economy*, Vol. 98 No. 4, pp. 703-38.

Fama, E.F. and French, K.R. (1992), "The cross-section of expected stock returns", *Journal of Finance*, Vol. 47 No. 2, pp. 427-65.

Fama, E.F. and French, K.R. (1993), "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics*, Vol. 33 No. 1, pp. 3-56.

Fama, E.F. and French, K.R. (1996), "Multifactor explanations of asset pricing anomalies", *Journal of Finance*, Vol. 51 No. 1, pp. 55-84.

Fama, E.F. and French, K.R. (2004), "The capital asset pricing model: theory and evidence", *Journal of Economic Perspectives*, Vol. 18 No. 1, pp. 25-46.

Finter, P., Niessen-Ruenzi, A. and Ruenzi, S. (2011), "The impact of investor sentiment on the German stock market", CFR Working Paper No. 10-03, Centre for Financial Research (CFR), University of Cologne, Cologne, October.

Fisher, K.L. and Statman, M. (2000), "Investor sentiment and stock returns", *Financial Analysts Journal*, Vol. 56 No. 2, pp. 16-23.

Gibbons, R.M., Ross, A.S. and Shanken, J. (1989), "A test of the efficiency of a given portfolio", *Econometrica*, Vol. 57 No. 5, pp. 1121-52.

Her, L.J.F., Masmoudi, T. and Suret, M.J. (2004), "Evidence to support the four factor pricing model from the Canadian stock market", *Journal of International Financial Markets*, Vol. 14 No. 4, pp. 313-28.

Hirshleifer, D. (2001), "Investor psychology and asset pricing", *Journal of Finance*, Vol. 56 No. 4, pp. 1533-98.

Iqbal, J., Brooks, R. and Galagedera, U.A.D. (2010), "Testing conditional asset pricing models: an emerging market perspective", *Journal of International Money and Finance*, Vol. 29 No. 5, pp. 897-918.

Jegadeesh, N. and Titman, S. (1993), "Returns to buying winners and selling losers: implications for stock market efficiency", *Journal of Finance*, Vol. 48 No. 1, pp. 65-91.

Jegadeesh, N. and Titman, S. (2001), "Profitability of momentum strategies: an evaluation of alternative explanations", *Journal of Finance*, Vol. 56 No. 2, pp. 699-720.

Kahneman, D. and Tversky, A. (1979), "Prospect theory: an analysis of decision under risk", *Econometrica*, Vol. 47 No. 2, pp. 263-91.

Keene, A.M. and Peterson, R.D. (2007), "The importance of liquidity as a factor in asset pricing", *Journal of Financial Research*, Vol. 30 No. 1, pp. 91-109.

Kumar, A. and Lee, C.M.C. (2006), "Retail investor sentiment and return comovements", *The Journal of Finance*, Vol. 51 No. 2, pp. 2451-86.

Lakonishok, J., Shleifer, A. and Vishny, W.R. (1994), "Contrarian investment, extrapolation, and risk", *Journal of Finance*, Vol. 49 No. 5, pp. 1541-78.

Lam, K.S.K. and Tam, K.H.L. (2011), "Liquidity and asset pricing: evidence from the Hong Kong stock market", *Journal of Banking & Finance*, Vol. 35 No. 9, pp. 2217-30.

Lewellen, J., Nagel, S. and Shanken, J. (2010), "A skeptical appraisal of asset pricing tests", *Journal of Financial Economics*, Vol. 96 No. 2, pp. 175-94.

Lintner, J. (1965), "The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets", *Review of Economics and Statistics*, Vol. 47 No. 1, pp. 13-37.

Liu, W. (2006), "A liquidity augmented capital asset pricing model", *Journal of Financial Economics*, Vol. 82 No. 3, pp. 631-71.

MacKinlay, A.C. (1995), "Multifactor models do not explain deviations from the CAPM", *Journal of Financial Economics*, Vol. 38 No. 1, pp. 3-28.

Marshall, B.R. and Young, M.R. (2003), "Liquidity and stock returns in pure order driven markets: evidence from the Australian stock market", *International Review of Financial Analysis*, Vol. 12 No. 2, pp. 173-88.

Merton, R.C. (1973), "An intertemporal capital asset pricing model", *Econometrica*, Vol. 41 No. 5, pp. 867-87.

Misra, A.K. and Mahakud, J. (2009), "Emerging trends in financial markets integration", *International Journal of Emerging Markets*, Vol. 4 No. 3, pp. 235-51.

Newey, W.K. and West, K.D. (1987), "A simple positive semi-definite heteroskedasticity and autocorrelation-consistent covariance matrix", *Econometrica*, Vol. 55 No. 3, pp. 703-8.

Pandey, I.M. and Bhat, R. (2007), "Dividend behaviour of Indian companies under monetary policy restrictions", *Managerial Finance*, Vol. 33 No. 1, pp. 14-25.

Ritter, J.R. (2003), "Behavioural finance", *Pacific-Basin Finance Journal*, Vol. 11 No. 4, pp. 429-37.

Ross, S.A. (1976), "The arbitrage theory of capital asset pricing", *Journal of Economic Theory*, Vol. 13 No. 3, pp. 341-60.

Sehgal, S. and Jain, S. (2011), "Short-term momentum patterns in stock and sectoral returns: evidence from India", *Journal of Advances in Management Research*, Vol. 8 No. 1, pp. 99-122.

Sehgal, S., Sood, G. and Rajput, N. (2009), "Investor sentiment in India – a survey", *Journal of Business Perspective*, Vol. 13 No. 2, pp. 13-23.

Sehgal, S., Sood, G. and Rajput, N. (2010), "Developing an investor sentiment index for India", *International Review of Business and Finance*, Vol. 2 No. 1, pp. 87-96.

Sharpe, W.F. (1964), "Capital asset prices: a theory of market equilibrium under conditions of risk", *Journal of Finance*, Vol. 19 No. 3, pp. 425-42.

Shefrin, H. (2005), *A Behavioural Approach to Asset Pricing*, Elsevier Academic Press, New York, NY.

Shiller, R. (2005), *Irrational Exuberance*, Princeton University Press, Princeton, NJ.

Shleifer, A. and Vishny, R. (1997), "The limits of arbitrage", *Journal of Finance*, Vol. 52 No. 1, pp. 35-55.

Shum, W.C. and Tang, G.Y.N. (2005), "Common risk factors in returns in Asian emerging stock markets", *International Business Review*, Vol. 14 No. 6, pp. 695-717.

Subrahmanyam, A. (2010), "The cross-section of expected stock returns: what have we learnt from the past twenty-five years of research?", *European Financial Management*, Vol. 16 No. 1, pp. 27-42.

Verma, R. and Soydemir, G. (2009), "The impact of individual and institutional investor sentiment on the market price of risk", *The Quarterly Review of Economics and Finance*, Vol. 49 No. 3, pp. 1129-45.

Verma, R. and Verma, P. (2009), "Are survey forecasts of individual and institutional investor sentiments rational?", *International Review of Financial Analysis*, Vol. 17 No. 5, pp. 1139-55.

About the authors

Saumya Ranjan Dash is working as a Senior Research Scholar in the Department of Humanities and Social Sciences, IIT Kharagpur. His research area for the doctoral dissertation is related to asset pricing and equity return. His research interest area includes financial market, portfolio management, and corporate finance.

Jitendra Mahakud is Associate Professor of Economics and Finance in the Indian Institute of Technology Kharagpur. He has obtained his PhD degree from the Indian Institute of Technology, Mumbai, India, in corporate finance. His areas of research and teaching include financial institutions and markets, corporate finance, investment management, financial econometrics, macroeconomics and monetary economics. He has published more than 20 papers in leading national and international journals. He has co-authored a book titled *Financial Institutions and Markets: Structure, Growth and Innovations* published by Tata McGraw-Hill. Jitendra Mahakud is the corresponding author and can be contacted at: jmahakud@hss.iitkgp.ernet.in

This article has been cited by:

1. Imlak Shaikh, Puja Padhi. 2016. On the relationship between implied volatility index and equity index returns. *Journal of Economic Studies* **43**:1, 27-47. [Abstract] [Full Text] [PDF]
2. Imlak Shaikh, Puja Padhi. 2014. Stylized patterns of implied volatility in India: a case study of NSE Nifty options. *Journal of Indian Business Research* **6**:3, 231-254. [Abstract] [Full Text] [PDF]
3. Saumya Ranjan Dash, Jitendra Mahakud. 2013. Conditional multifactor asset pricing model and market anomalies. *Journal of Indian Business Research* **5**:4, 271-294. [Abstract] [Full Text] [PDF]